

## Nursing documentation related to respiratory process: content analysis of portuguese health records

### Análise de conteúdo à parametrização portuguesa relacionada com o processo respiratório

### Análisis de contenido de la parametrización portuguesa relacionada con el proceso respiratorio

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## ABSTRACT

**Background:** data sharing from clinical practice is crucial to support nurses' decision-making process, improve nursing outcomes, and increase the quality of care. In Portugal, International Classification for Nursing Practice is used to document care being necessary for the standardization of this process preventing information redundancy.

**Objectives:** (1) to identify diagnoses and interventions used by Portuguese nurses related to Respiratory Process, (2) to suggest unified diagnoses and interventions syntaxes.

**Methodology:** qualitative study with a content analysis. The sample included data regarding e-documentation of nursing diagnosis and interventions customized in the nursing public information system until 2019.

**Results:** of the initial sample of 1502 diagnoses aroused 28 and from 2060 interventions emerged 73 as the most relevant. The main findings were: two areas of nursing attention, one related to respiratory function and the other to patient's learning abilities, diversity of diagnoses and interventions to express the same needs resulting from a variety of taxonomic misunderstandings, and lack of standardized language.

**Conclusions** nursing documentation have two dimensions representing the complexity of nursing care. It also shows that using standardized language does not prevent information redundancy resulting in different diagnoses and interventions to express the same needs.

**Keywords:** nursing diagnosis; nursing process; advanced practice nursing; respiration

## RESUMO

**Enquadramento:** a partilha de dados da prática clínica é crucial para apoiar o processo de tomada de decisão, Em Portugal a CIPE é utilizada para documentar os cuidados de enfermagem sendo necessária a uniformização deste processo de forma a evitar redundância de informação.

**Objetivos:** (1) identificar diagnósticos e intervenções utilizados por enfermeiros portugueses relacionados com o Processo Respiratório, (2) sugerir sintaxes unificadas de diagnósticos e intervenções.

**Metodologia:** estudo qualitativo com análise de conteúdo análise de conteúdo. A amostra incluiu dados referentes à documentação eletrónica customizada no sistema público de informação de enfermagem até 2019.

**Resultados:** da amostra inicial de 1502 diagnósticos emergiram 28 e de 2060 intervenções surgiram 73 como os mais relevantes. Os principais achados foram: duas áreas de atenção de enfermagem, uma relacionada com função respiratória e outra com habilidades de aprendizagem do cliente, diversidade de diagnósticos e intervenções para expressarem as mesmas necessidades decorrentes de equívocos taxonómicos e de falta de linguagem padronizada.

**Conclusão:** os diagnósticos e intervenções de enfermagem possuem duas dimensões que representam a complexidade do cuidado de enfermagem. O uso de linguagem padronizada não impede a redundância de informações resultando em diagnósticos e intervenções diferentes para expressar as mesmas necessidades.

**Palavras-chave:** diagnósticos de enfermagem; processo de enfermagem; prática avançada de enfermagem; respiração

## RESUMEN

**Marco contextual:** el cambio de datos resultantes de la práctica clínica es crucial para apoyar el proceso de toma de decisiones. Portugal, utiliza la CIPE para documentar la práctica clínica, siendo necesaria la estandarización de lo proceso evitando redundancia de información.

**Objetivos:** (1) identificar diagnósticos e intervenciones utilizados por enfermeros portugueses relacionados con el Proceso Respiratorio, (2) sugerir sintaxis unificadas de diagnósticos e intervenciones.

**Metodología:** diseño cualitativo con análisis de contenido. La muestra incluyó datos sobre documentación electrónica en el sistema de información pública de enfermería hasta 2019.

**Resultados:** 1502 diagnósticos surgieron 28 y de 2060 intervenciones surgieron 73 como los más relevantes. Los principales hallazgos fueron: dos áreas de atención de enfermería, una relacionada con la función respiratoria y otra con las habilidades de aprendizaje del paciente, diversidad de diagnósticos e intervenciones para expresar las mismas necesidades resultantes de una variedad de malentendidos taxonómicos, falta de lenguaje estandarizado.

**Conclusión:** los resultados muestran que la documentación de enfermería tiene dos dimensiones representando la complejidad del cuidado de enfermería. También muestra que el uso de un lenguaje estandarizado no evita la redundancia de información resultando en diferentes diagnósticos e intervenciones para expresar las mismas necesidades.

**Palabras-clave:** diagnósticos de enfermería; proceso de enfermería; enfermería de práctica avanzada; respiración

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## INTRODUCTION

Nowadays, the volume of nursing information related to respiratory process is continuously growing. The large amount and richness of this information represents a huge challenge for the development of nursing information systems, which must be able to evolve in order to maximize this powerful resource.

Standardizing how this data is collected, processed, shared, and stored is essential. It allows nurses to make clinical judgments, create nursing diagnoses, and prescribe, implement, and evaluate nursing interventions daily. Thus, it is expected that this data can be modelled and organized to be converted into information and later in scientific knowledge backing up evidence-based practice supporting clinical nursing decision-making (Lee & Park, 2017). The quantity and the complexity of nursing information have increased these recent years forcing information systems to evolve and adapt not only to new scientific knowledge but also to the new health organization. In this process, it is very important to address the changes that nursing documentation has undergone, as the form and content of nurses' documentation today are substantially different when compared to the documentation carried out in the past (Yue et al., 2022).

Nowadays the volume of nursing information related to the respiratory process is continuously growing, being crucial to standardize the way this data is collected, processed, shared and stored (Wang et al., 2019). This process will allow nurses to make clinical judgments and creating nursing diagnoses, as well as prescribing, implementing and evaluating nursing interventions, on a daily basis. It is thus expected that this data can be modelled and organized, in a way that can be converted into information and later-on in scientific knowledge backing evidence-based practice and support nurse's clinical decision-making (Lee & Park, 2017).

The aims of this study were (1) to identify the nursing diagnoses and the nursing interventions used by Portuguese nurses related to Respiratory Process and (2) to suggest unified nursing diagnoses and nursing intervention syntaxes related to Respiratory Process.

## **BACKGROUND**

Throughout nursing history, there has always been a great concern with the nursing documentation resulting from clinical practice. In the 19th century, Florence Nightingale emphasized its importance and relation with the quality of nursing care (Gilber, 2020). We could say that a nursing information system is related to a contextualized set of data that, when appropriately provided, give guidance, instruction, and knowledge to nursing practice (Queirós et al., 2021). To fulfil this goal, the Ordem dos Enfermeiros adopted the International Classification for Nursing Practice (ICNP®) as the standard language for nursing documentation in 2007. Based on care units' individual parameterization, the strategy created a considerable number of nursing diagnoses and interventions to define the same clinical situation promoting information redundancy and enabling the production of nursing outcomes. It was then crucial to step up and evolve towards aggregating the most relevant information. The first step towards this aggregation occurred in 2014 with the content analysis of nursing national data parameterization made by Oporto Nursing School to propose unified diagnoses and interventions and the structural relationship between them (Silva et al., 2014).

The growth of the Nursing Information System allowed using clinical data to sustain and evolve nursing knowledge improving nursing care within its domains. Thus, the information nurses produce has become a potential outcome of nursing care and improves care. Clark & Lang, in 1992, wrote that what cannot be named cannot be controlled, practiced, taught, financed, and included in the health policy (Clark & Lang, 1992). They highlighted a critical point and recognized that how nurses communicate with society, with each other, and with other stakeholders, or how each nurse uses his knowledge in patient care is related to the way it's organized.

Nurses need to describe and report their practice regularly and systematically. Thus, reducing redundancy by using a standardized language that promotes the capacity to communicate between different information systems and contributes to supporting nursing care, and effective nursing decision-making enabling

easy retrieval and analysis of nursing data (Lingtong et al., 2018). Integrating nursing data in large datasets represents a considerable challenge that can be achieved using a controlled taxonomy instead of unstructured text data, helping aggregate terms (Sun et al., 2021).

The coexistence of heterogeneous and non-communicating health information systems narrows information sharing, impairing interoperability. It is necessary to evolve to a multilevel structure based on Clinical Data Models where the information is outside the software (Hak et al., 2020). These models express relevant concepts of clinical practice, and the relationship between them allows semantic interoperability by ensuring that understandable information over time is available at the place and time to care delivery (McCarthy et al., 2018).

The Oporto Nursing School always had an important role in Portuguese nursing information systems building the informatics model that housed electronic nursing documentation and creating the Centre for Information Systems Research and Development – CIDESI, accredited by ICN® in 2010. The present study is part of a much wider research protocol. This protocol aims to create a Nursing Clinical Data Model related to the Respiratory process to be included in a Nursing Ontology that will be used in the Portuguese health information system.

## METHODOLOGY

### Study Design

Qualitative, exploratory, and descriptive study was developed with a content analysis of nursing anonymized e-documentation. The study only includes e-documentation data not involving patients.

The study comprised two phases:

Pre-analysis to identify, collect and assemble all the diagnoses and interventions related to the respiratory process produced in the Portuguese public electronic health record (EHR), from hospital and primary care, up to 2019.

Content analysis (using Bardin's methodology) (Bardin, 2012) based on the ICNP® 2019 version of the data collected in the first stage.

### Phase 1: Pre-analyse

It was analysed the Portuguese nursing parametrizations of the nursing diagnoses and nursing interventions related to the respiratory process produced in the Portuguese public EHR, from both hospital and primary care, up to 2019.

### Exclusion criteria applied to Nursing Diagnoses

The exclusion criteria were pre-defined, excluding diagnoses that, despite being linked to the respiratory process, did not match the study aims, such as: Diagnoses related to nursing focus "**Suffocation**", "**Aspiration**" and "**Safety precautions**"- linked to risk conditions rather than reflecting real problems;

Diagnoses associated with the "**Ability to swallow**" - linked to the deglutition process;

Diagnostics related to "**Fatigue**" - emerging in this context by the impact of the shortness of breath in the activities of daily living;

Diagnostics associated with **Outcomes** not related to patient nursing care needs.

Our study only included e-documentation of adult patients, so we have excluded from the analysis e-documentation from children and adolescents as well as caregivers, mother, and/or father.

Based on a free reading of all extracted data, we have established additional exclusion criteria:

**Incomplete Diagnoses:** only provided "*nursing focus*" or were not specific enough (e.g., "ventilation")

**Dissonance between focus and status group:** disagreement between the focus of attention and the status group, either by dimension or by a qualifier (e.g., "Hypoventilation: learning of coughing skills not demonstrated")

**Incomprehensive Diagnoses:** ambiguous level of nursing focus (e.g., "Knowledge about expectoration sample")

#### **Exclusion criteria applied to Nursing Interventions**

It was excluded from the analysis all the interventions that followed these criteria:

**Incomplete interventions:** only provided the type of action or poorly specification of the intervention target (e.g. "auscultating")

**Incomprehensive or Ambiguous Intervention:** associated with an incomprehensive level of nursing intervention that can lead to contradictory interpretations (e.g., "Teaching patient to perform postural drainage with an insufflator/exsufflator device")

**Uselessness or absence of specification interventions:** interventions with none clinical use or lack of specification (e.g. "Instruct about adaptive equipment")

**Medical prescription-related Interventions:** related to medical prescriptions (e.g., "Perform inhalation therapy with isotonic saline")

**Collaborative interventions:** suggest collaboration between other health partners (e.g., "Perform Oxygen therapy")

**Interventions linked to the nursing focus "Suffocation" and "Aspiration":** removed because of the association with risk condition and are not targeted to the nursing focus of attention.

**Interventions linked to "Ability to swallow" were removed because they are linked to the deglutition process.**

#### **Phase 2: Content Analysis**

After identifying the diagnoses and the interventions, for content analysis, three main rules were used: (1) updating all terminology to the ICNP® 2019 customization structure to promote language standardization, (2) *a priori* categorization structure according to the ISO® 18104 Standards, and (3) data analysis to avoid conceptual redundancy and ambiguity.

Some encoding rules were pre-defined, as nursing diagnoses were concerned: (1) aggregating similar nursing focus in the same concept (e.g., Respiration, Hypoventilation, Hyperventilation were aggregated in "Ventilation"), (2) including all terms expressing negative judgment in the term "Impaired" and (3) removing the specification levels of the diagnosis judgment (e.g., "Impaired ventilation in a high degree").

Regarding nursing interventions, the encode rules adopted were: (1) associating qualitative data to Surveying Interventions (e.g., "Surveying airway clearance"), (2) linking qualitative data to Surveying Interventions (e.g., "Surveying airway clearance"), (3) aggregate nursing interventions that express focus on diagnostic activity (e.g., Assessing ventilation") in the Assessing interventions, (4) associating more systematized information (e.g., "Teaching Pathological Process") to Teaching interventions and (5) linking practical information (e.g., "Instructing to optimize ventilation") to Instruct interventions.

#### **Ethical Principles**

All ethical imperatives were respected, and the study complied with the Declaration of Taipei and Helsinki.

The Portuguese Health Ministry provided all data, and the researchers only have access to anonymized data. Ethical approval of the project was granted by the Oporto Nursing School Ethics Committee (no. 560/2021).

## **RESULTS**

## Phase 1: Pre-analyse

We retrieved from the original analysis corpus 1502 diagnoses and 2060 interventions remaining 821 diagnoses and 1055 interventions after exclusion criteria to phase two of the study.

## Phase 2 - Content Analysis

### Nursing Diagnoses

The remaining 821 were submitted to the encode rules (previously established) resulting in 35 nursing diagnoses syntax categories centred on Respiratory Process (Table 1)

Table 1

Data post-analysis of the active customization: Diagnoses per focus

Nursing Focus	Nursing Diagnoses
Activity Intolerance	Activity intolerance Activity intolerance: Potential to enhancing ability in energy conservation Activity intolerance: Potential to enhancing knowledge about energy conservation
Airway Clearance	Impaired Airway clearance Impaired Airway clearance: Potential to enhance ability in airway clearance Impaired Airway clearance: Potential to enhance knowledge of promoting airway clearance Impaired Airway clearance: Potential to enhance knowledge of inhalation therapy Impaired Airway clearance: Readiness to enhance the ability to perform inhalation therapy
Expectoration	Impaired Expectoration Impaired Expectoration: Potential to enhance knowledge of expectoration Impaired Expectoration: Potential to enhance ability in expectoration Impaired Expectoration: Potential to enhance the ability to perform inhalation therapy Impaired Expectoration: Potential to enhance knowledge of inhalation therapy
Cough	Impaired cough Impaired cough: Potential to enhance the ability to cough Impaired cough: Potential to enhance knowledge of cough
Functional Dyspnea	Functional Dyspnoea Functional Dyspnoea: Potential to enhance the ability to optimize ventilation Functional Dyspnoea: Potential to enhance knowledge of optimizing ventilation Functional Dyspnoea: Potential to enhance the ability to use non-invasive ventilation device Functional Dyspnoea: Potential to enhance knowledge of non-invasive ventilation Functional Dyspnoea: Potential to enhance the ability to use oxygen therapy Functional Dyspnoea: Potential to enhance knowledge of oxygen therapy Functional Dyspnoea: Potential to enhance knowledge of energy conservation Functional Dyspnoea: Potential to enhance ability in energy conservation
Ventilation	Impaired Ventilation Impaired Ventilation: Potential to enhance the ability to optimize ventilation Impaired Ventilation: Potential to enhance knowledge to optimize ventilation Impaired Ventilation: Potential to enhance knowledge on non-invasive ventilation Impaired Ventilation: Potential to enhance the ability to use non-invasive ventilation device
Dyspnea	Dyspnea Dyspnea: Potential to enhance the ability to optimize ventilation Dyspnea: Potential to enhance the knowledge to optimize ventilation Dyspnea: Potential to enhance the ability to use oxygen therapy Dyspnea: Potential to enhance knowledge of oxygen therapy

### Nursing Interventions

Out of the nursing interventions that arose from phase 1, 76 categories emerged, corresponding to 76 nursing interventions. For content analysis purposes, these nursing interventions were then divided into four categories: (1) Surveillance/Evaluation activities, (2) Informing related Interventions, (3) Performing related Interventions, and (4) Intention related interventions. This division was made according to the different phases of the nursing process as the nursing interventions are performed to fulfil a predetermined objective, usually to respond to an identified nursing diagnosis.

The final intervention categories are presented in table 2.

Table 2

## Final Interventions Categories

Diagnostic related interventions	Informing interventions	Performing interventions	Intention interventions
<b>ASSESSING</b> Ability to: promote airway clearance expectorate optimize ventilation Knowledge about (...) Airway clearance Cough Ventilation Activity Intolerance <b>EVALUATING</b> Knowledge about (...) Ability to perform Inhalation therapy <b>SUPERVISING</b> Breathing exercises <b>MONITORING</b> Expired CO <sub>2</sub> Oxygen concentration Respiratory frequency Arterial gases Peak expiratory flow Oxygen saturation Expiratory volume <b>SURVEYING</b> Dyspnea Expectoration Airway clearance Cough reflex Breathing Cough Ventilation Auscultating lung	<b>TEACHING</b> Energy conservation Pathological Process Non-invasive ventilation <b>INSTRUCTING</b> Inhalation therapy Optimize ventilation Cough Non-invasive ventilation Breathing exercise Chest expansion exercises Expectoration techniques Breathing devices Airway clearance techniques Respiratory devices Oxygen therapy Exercise regime Ventilatory exercises Muscle or joint exercise technique <b>TRAINING</b> Expectoration drainage Cough Energy conservation Inhalation therapy Use of respiratory devices Oxygen therapy Breathing exercise Non-invasive ventilation Respiratory devices	<b>PERFORMING</b> Inhalation therapy Breathing techniques Chest expansion exercises Airway clearance techniques Ventilation with manual insufflator/exsufflator <b>APPLYING</b> breathing device insufflation/exsufflation device <b>ASPIRATING</b> Airway suction <b>ASSISTING</b> Expectorate Cough <b>ELEVATING</b> Fowler Position <b>MANAGING</b> Inhalation therapy Liquid ingestion Oxygen therapy <b>ESTIMATE</b> Cough reflex	<b>OPTIMIZING</b> Inhalation therapy Ventilation with non-invasive ventilation Ventilation with positioning Ventilation with respiratory devices <b>PLANNING</b> Activity

## DISCUSSION

The results obtained represent the main nursing diagnoses and nursing interventions identified by Portuguese nurses related to Respiratory Process. In the content analysis findings, it is possible to identify two dimensions of nursing care: nursing diagnoses and nursing interventions related to impaired function and those that is centred on patients learning capacities and knowledge to cope with the new condition.

### Nursing Diagnosis

The nursing diagnoses directly linked to changes in respiratory function were mainly based on signs and symptoms management.

In the content analysis due to upgrading to ICNP 2019 we aggregate several diagnoses because it were not present in the 2019 version (e.g. diagnoses related to the nursing focus "*Breathing*" in the nursing focus "*Ventilation*"). We also linked several nursing diagnoses associated to "*Gaseous Exchange*" in nursing focus "*Ventilation*", as we considered that gaseous exchange should be considered as assessment data rather than nursing diagnoses. In fact, hypercapnia for example is the independent risk factor of mortality in COPD, and is an important data to define "*Impaired ventilation*" nursing diagnostic (Csoma et al., 2022). Nursing diagnoses identified as "*Orthopnea*" were included in the category "*Dyspnea*", has the nursing focus of attention seems to be the breathlessness itself, not the body position, this is the case in COVID-19 patients that the body position

improved dyspnea because of the physiological effect of the Fowler position or prone position in the respiratory process rather the position itself (Hentsch et al., 2021)

Nursing diagnoses like "*Dyspnoea*" and "*Functional Dyspnoea*", affecting the patient's ability to perform certain daily living activities, represent critical clinical data. This data will help the assessment and the clinical decision-making process, playing a crucial role in developing the Clinical Data Model, using this information not only as diagnoses but also as data. Other diagnoses found are related to impaired functions due to changes in the respiratory process and are sensible to nurses' interventions such as "*Impaired Airway Clearance*" or "*Impaired Ventilation*"

In our results, we found linkage of focus and different judgements (e.g. "Low Ventilation" and "Impaired Ventilation"), describing similar forms to define the same thing. This resulted in different diagnoses being used by nurses to express the same needs. Semantic redundancy between terms adopted for focus and judgements explained most of the disparity found before and after the content analysis. The core focus of nursing attention should be expected to have clear standard terms to describe patient needs. However, this is not the case.

However, nursing care is not only focused on physiologic function impairment and signs and symptoms management; even though some areas of its practice are under its responsibility, the nursing perspective should follow the patient-centered care model structured around the client (Oreofe & Oyenike, 2018). In this context, nursing care can become meaningful by helping cognitive integration and behavioural and emotional responses in daily activities leading to the preservation of autonomy, independence in self-care, and well-being. The main goal is the development of patient cognitive, behavioural, building emotional skills to obtain mastery of dealing with new situations facilitating the transition process (Meleis, 2012).

Diagnoses related to learning capacities seek to integrate and train the patient, promoting self-management skills by moving to a collaborative care model focused on the patient's needs and decisions.

In this dimension, nurses recognize the potential to adapt to a new condition, enabling and motivating to improve the health status. In 2022 The Cochrane Library published a systematic review and concluded that self-management interventions for people with COPD are associated with improvements in quality of life and a lower probability of respiratory-related hospital admissions (Schrijver et al., 2022),

Including the patient in the care process becomes crucial and is an essential step towards a healthy transition. Training and empowerment are key parts of the whole process, which starts with awareness and continues with the improvement of knowledge and the ability to optimize his decision-making process. (Meleis, 2012). Nursing diagnoses like "*Potential to enhance knowledge to optimize ventilation*" express how nurses recognize the client's potential for adaptation to the new condition by developing appropriate response patterns.

Yue et al (2022) described that despite nursing information systems has changed the way nursing is practiced, mixed findings have been identified in terms of information quality and access, documentation burden, time spent on patient care and ultimately, nurse and patient satisfaction with implications on the implementation (Yue et al., 2022). Also, there is a lack of agreement about what descriptors to use in terminologies. Even with the use of standardized language, the locally customization will cause variability and dispersion of terms that impairs semantic interoperability. Sun et al (2021) found that the lack of semantic interoperability is cited as a primary reason for inefficiencies within the healthcare system. Thus, semantic interoperability is essential for accurate and advanced health-related computing and EHR sharing (Sun et al., 2021). Similar findings have been found by Neves & Parente (2019), Goncalves et al. (2018) and Cruz et al. (2016) in their content analysis of Portuguese nursing diagnoses in the neuromuscular process, mental health records and on the management of treatment regimen, respectively. This suggests that nursing care parametrization should be national rather than institutional.

### **Nursing Interventions**



The content analysis allowed us to understand some difficulties nurses have in describing the nursing interventions. One of these difficulties was the lack of standardized language leading to a considerable number of interventions, most redundant or without clinical benefit.

The verbal dispersal documenting nursing interventions stood out throughout the content analysis. For example, for the intervention "Airway suction", nurses identify "Suctioning the patient", "Performing airway clearance", and "Extract secretions", among other terms. Different intervention syntaxes were also found in the analysis (e.g., 82 different sentences records were found to identify the nursing intervention "Instruct about breathing exercise"). A consequence of this fact was the creation of a huge and very heterogeneous amount of information with no clinical benefits, compromising semantic interoperability and the production of outcomes. These findings are consistent with the scientific knowledge published about nursing information systems. Many studies stand the need for effective use of standardized nursing language as it is fundamental to produce nursing outcomes (Wang et al., 2019). The use of several standard languages combined with different parametrization make it difficult to aggregate and generalize findings (Fennelly et al., 2021)

Another finding in the content analysis was the granularity of the interventions, especially those related to nursing techniques. We choose not to increase detail because we felt that the nursing attention should not be on the technique itself but the purpose of it. (e.g., "Perform airway clearance technique" rather than "Perform postural drainage of the apical segment of the right upper lobe").

Compared with the conventional information records, standardized nursing language is more consistent. Its use enables the implementation of systematic and standardized practice, thereby improving the quality of care. Schenk et al. in 2018 concluded that nurses spent significantly more time with their patients in contexts that use nurses' information systems (Schenk et al., 2018).

Although the use of standardized language is a significant upgrade to nursing practice, the challenge of nursing information systems is to reduce redundancy and to improve semantic interoperability (Sun et al., 2021). We are now facing a double challenge: improving semantic interoperability within and between the system and aggregate information about nursing care, reducing diagnostic and intervention variability, improving information intelligibility (Silva et al., 2014). Thus, nurses must define what data or information incorporates the best practices to sustain clinical decisions through shareable nursing concepts based on the best scientific evidence to produce solid outcomes (Lingtong et al., 2018).

## CONCLUSIONS

This study identified the most relevant nursing diagnoses and nursing interventions related to the respiratory process, produced by Portuguese nurses suggesting unified diagnoses and interventions syntaxes. It also shows both the importance of using standardized data to identify correctly nursing diagnoses and nursing interventions in order to achieved semantic interoperability laying the basis to build a nursing clinical data model and contributing to developing a nursing ontology.

Another conclusion of this study is the lack of consensus on nursing documentation confirming the need for standardization of nursing language to prevent disparity of terms to describe the same condition.

Nowadays semantic interoperability is a crucial outcome to the development of the modern nursing information system regarding not only the production of nursing outcomes but also improving evidence-based practice. This only can be possible with high quality information available to help nursing clinical decision in order to improve quality of nursing care. This result may bring an important contribution to improve electronic information systems and contributing for a more reliable nursing outcomes providing evidence of the important role of nursing in healthcare.

This study does have some limitations. One of these limitations is the fact that the criteria applied in the diagnoses and interventions analysis were only based on Portuguese nursing reality however nursing's competences may be different in other countries. Other limitation is the fact the focus to be included in the study and the eligibility criteria were defined by the research team.

We think that further investigation should be carried out not only in Portugal analysing not only the nursing diagnoses and the nursing interventions but also centred in the other nursing process phases.

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